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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/980,321	11/15/2001	Yoshinori Mashiko	4353	9792

7590 11/18/2005
Carothers and Carothers
445 Fort Pitt Blvd Suite 500
Pittsburgh, PA 15219

EXAMINER

DUONG, THANH P

ART UNIT	PAPER NUMBER
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1764

DATE MAILED: 11/18/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/980,321

Applicant(s)

MASHIKO ET AL.

Examiner

Tom P. Duong

Art Unit

1764

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 31 August 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 10-21 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 10-21 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Applicants' remarks and amendments filed on August 31, 2005 have been carefully considered. Claims 1-9 have been canceled. Claim 1 has been amended. Claim 10 has been amended. Claims 10-21 are now pending in this application.

Claim Rejections - 35 USC § 102 / § 103

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

1. Claims 10-12 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Japanese Publication 11-106770 (JP '770). Regarding claim 10, JP '770 discloses a method of producing town gas (methane) comprising the steps of: (A) preparing dimethyl ether (DME) as feed stock (Fig. 4); (B) evaporating said dimethyl ether (heated by exhaust gas 1) and; (C) exothermically reforming (5) said dimethyl ether with steam (Abstract) in the presence of catalyst containing ruthenium or containing nickel, cerium and alumina (Sections 0020-0021) and steam to produce reformed gas consisting mainly methane (Section 0028). JP '770 is silent with respect to the reformed gas containing mainly methane which a yield (except H₂O) at outlet of the final reforming reactor is at least 50.6 mol % and

containing CO of which a yield (except H₂O) at outlet of the final reforming reactor is less than 1.8mol %. However, JP '770 discloses the same method of producing town gas with the same reactants and the same reforming process as the claimed invention; thus, one of ordinary skill in the art would have expected the result product composition (CH₄ and CO) are the same as the claimed invention or at most thru routine optimization. Note, where the claimed and prior art products are identical or substantially identical in structure or composition, or are produced by identical or substantially identical processes, a prima facie case of either anticipation or obviousness has been established. See *In re Best*, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977) and *In re Spada*, 911 F.2d 705, 709, 15 USPQ2d 1655, 1658 (Fed. Cir., 1990). Regarding claim 11, JP '770 disclose the quantity of said steam on reforming is within 10/1 to 0.5/1 molar ratio of steam/dimethyl ether (Section 0027). Regarding claim 12, JP '770 discloses the temperature for catalytic reforming of said dimethyl ether (DME) is within 200°C to 600°C (Section 0028).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of

the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

2 Claims 14-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP '770 in view of Mandelik (3,771,261). JP '770 fails to disclose the DME is divided and supplied to adiabatic fixed bed reactors and the remaining portion of DME to subsequent reactors. Mandelik teaches the majority of the methane gas is fed to a primary reformer to convert methane gas to synthesis gas, and a minor portion is feed to the secondary reformer to convert the remaining methane gas to synthesis gas (Abstract). This method or concept of splitting the feed to primary and secondary reformers can be applied in the same manner as splitting the DME feed to each reformer as described in the claimed invention to ensure maximum conversion of DME gas to synthesis gas. Thus, it would have been obvious in view of Mandelik '261 to one having ordinary skill in the art to modify the method of producing town gas of JP '770 with splitting DME feed stream to primary and secondary reformers in order to maximize the conversion of DME to synthesis gas.

3 Claims 13 and 15-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP '770 in view of Japanese Publication 56-002919 (JP '919). Regarding claims 13 and 15, JP '770 fails to disclose dimethyl ether (DME) is supplied serially to adiabatic fixed bed reactors through cooling means installed between said reactors. JP '919 discloses coolers (7,9) between reformers (5) and (13) as shown in Fig. 1 to cool the reforming gas prior art to feeding to the methanator. Thus, it would have been obvious in view of JP '919 to modify the method of producing town gas of JP '770 with cooler means as taught by JP '919 in order to cool the reforming gas prior to feeding to the methanator. Regarding claim 16, JP '770 fails to disclose carbon dioxide by-produced by said reforming of said DME is removed from said reforming gas after reforming said DME. JP '919 teaches the reforming gas is feed to the carbon dioxide absorber (18) to remove carbon dioxide in order to obtain a rich methane gas product. Thus, it would have been obvious in view of JP '919 to one having ordinary skill in the art to modify the method of producing town gas of JP '770 with feeding the reforming gas to carbon dioxide absorber to remove carbon dioxide in order to obtain a rich methane gas product.

4. Claims 16-17 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP '770 in view of Faust et al. (4,171,343). Regarding claims 16 and 17, JP '770 fails to disclose carbon dioxide by-produced by said reforming of said DME is removed from said reforming gas after reforming said DME, and the absorption solution of aqueous alkanolamine and potassium carbonate. Faust teaches the reforming gas is

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fed to a CO₂ removal system 16, which utilizes aqueous triethanolamine and potassium carbonate solution (Col. 4, lines 21-30) to remove CO₂ prior to feeding to the methanator (17). Thus, it would have been obvious in view of Faust '343 to one having ordinary skill in the art to modify the method of producing town gas of JP '770 with CO₂ removal system with aqueous alkanolamine and potassium carbonate as taught by Faust in order to remove CO₂ by-product. Regarding claim 20, Faust discloses the reforming gas comprising of hydrogen, carbon monoxide, and carbon dioxide (Col. 3, line 55) and these components are converted into methane by a methanator (17).

5. Claims 14, 16, 18, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP '770 in view of Winter (4,613,492). Regarding claim 14, JP '770 fails to disclose the DME feed is divided and supplied to adiabatic fixed bed reactors and the remaining portion of DME to subsequent reactors. Winter '492 teaches the important to bypassing a portion of the feed around the primary reformer to the secondary reformer (col. 1, lines 65-70) to reduce the overall cost of the reforming system and operating cost (Col. 2, lines 3-6). The method or concept of bypassing a portion of the hydrocarbon gas around the primary reformer to the secondary reformer can be applied in the same manner as splitting the DME feed to each reformer as described in the claimed invention so that the equipment and operating costs of the reforming system is minimized. Thus, it would have been obvious in view of Winter to one having ordinary skill in the art to modify the method of producing town gas of '770 with bypassing a portion of the hydrocarbon gas or DME gas around the primary

reformer to secondary reformer as taught by Winter in order to reduce the equipment and operating costs. Regarding claims 16 and 18, JP '770 fails to disclose carbon dioxide by-produced by said reforming of said DME is removed from said reforming gas after reforming said DME, and the carbon dioxide is removed from said reforming gas by adsorption by a pressure swing method. Winter '492 teaches carbon dioxide by-product is removed from the reformed gas by a pressure swing adsorption (PSA). Thus, it would have been obvious to one having ordinary skill in the art to modify the method of producing town gas of JP '770 with PSA as taught by Winter '492 in order to removal undesirable CO₂ by-product. Regarding claim 20, Winter discloses the reforming gas comprising of hydrogen, carbon monoxide, and carbon dioxide (Col. 1, lines 20-23) and these components are converted into methane by a methanator (Fig. 1).

6. Claims 16 and 19-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over JP '770 in view of Ho (6,579,331). Regarding claims 16 and 19, JP '770 fails to disclose carbon dioxide by-produced by said reforming of said DME is removed from said reforming gas after reforming said DME, and the carbon dioxide is removed from said reforming gas by selective separation membrane. Ho '331 teaches the use of a CO₂ selective membrane as shown in Figure 2 to purify the reforming gas (Col. 4, lines 18-23) by removing CO₂ content prior feeding to the methanator to generate town gas (methane). Thus, it would have been obvious in view of Ho '331 to one having ordinary skill in the art to modify of producing town gas of JP '770 with CO₂ selective membrane to remove undesirable CO₂ by-product from the reforming gas. Regarding claim 20, Ho

discloses shows on Figure 2 the reforming gas comprising of hydrogen, carbon monoxide, and carbon dioxide and these components are converted into methane by methanator (Fig. 2).

7. Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over JP '770 in view of Japanese Publication 11-293263 (JP '263). JP '770 fails to disclose a portion of said DME is added to said reformed gas as carburant. JP '263 teaches DME is mixed with natural gas (methane gas) as a carburant agent (Section 0013) in order to increase the calorific value or heat value of the town gas (Section 0017). Thus, it would have been obvious in view of JP '263 to one having ordinary skill in the art to modify the production of town gas of JP '770 with mixing DME with methane gas in order to increase the heat value of the town gas.

Response to Arguments

Applicant's arguments filed August 31, 2005 have been fully considered but they are not persuasive. Based on stoichiometric reaction between DME and steam, JP '770 discloses the same product yield as the claimed invention as shown in Applicant disclosure (Tables 2 and 3). Applicants attempt to show a higher production of methane by excluding H₂O does not change the actual product composition. Note, H₂O contributed to at least 30% (32.8% and 45.7%) in Tables 2 and 3 of the specification. The calculation for the actual methane yield must factor into every byproducts including H₂O. JP '770 clearly discloses the production of town gas is an exothermic process

(Section 0012) and the reforming process requires the same amount of steam/DME ratio; same reforming temperature range (Abstract); same reforming catalyst (Section 0020-0021); thus, one of ordinary skill in the art would have expected reforming process of JP '700 produces the same results or at most thru routine experimentation.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tom P. Duong whose telephone number is (571) 272-2794. The examiner can normally be reached on 8:00AM - 4:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn Caldarola can be reached on (571) 272-1444. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Tom Duong
November 4, 2005
TD



Glenn Caldarola
Supervisory Patent Examiner
Technology Center 1700